



## PATENT ABSTRACTS OF JAPAN

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(21) Application number: **61255476**(71) Applicant: **NEC CORP**(22) Date of filing: **27.10.86**(72) Inventor: **TORIKAI TOSHITAKA****(54) SEMICONDUCTOR PHOTODETECTOR****(57) Abstract:**

**PURPOSE:** To improve sensitivity, and to lower noises extremely by forming multi-periodic structure, in which one of mixed crystals consisting of Si, Ge and Sn is shaped in a lattice constant larger than a III-V compound semiconductor substrate and the other in a lattice constant smaller than the substrate, onto the substrate.

**CONSTITUTION:** A Be-doped p-GaAs buffer layer 2, a p-SiGeSn multi-periodic layer 3 as an optical absorption layer, a p-SiGe lattice mismatching relaxing layer 3', and a p-Si layer 4 for avalanche multiplication are laminated onto a Zn-doped p<sup>+</sup>-GaAs substrate 1 in succession through a molecular beam epitaxial method. That is, Ge<sub>0.85</sub>Sn<sub>0.15</sub> having a lattice constant larger than GaAs and Si<sub>0.85</sub>Sn<sub>0.15</sub> having a lattice constant smaller than GaAs are laminated alternately at every fifty period at every thickness such as 100Å; in the layer 3, and the Si<sub>1-z</sub>GeZ layer 3' is grown so that a composition (z) is reduced with separation from the substrate, and changed into the Si layer 4. Mutually opposite electrodes 7, 8 apply reverse bias voltage between 7 and 8, and the layers 4, 3', 3 are depleted toward the substrate side from an n<sup>+</sup>-p junction on the

boundary of the layers 5, 4. Beams are projected through an SiO<sub>2</sub> layer 6.

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